Wels Catfish (*Silurus glanis*)
Ecological Risk Screening Summary

Web Version – 8/14/2012

Photo: http://animal.discovery.com/fish/river-monsters/killer-fish-photos/images/wels-catfish-photo-01.jpg

1 Native Range, and Status in the United States

Native Range
From Freyhof and Kottelat (2008):

"Afghanistan; Albania; Armenia; Austria; Azerbaijan; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; China; Croatia; Czech Republic; Denmark; Estonia; Finland; France; Georgia; Germany; Greece; Hungary; Iran, Islamic Republic of; Italy; Kazakhstan; Kyrgyzstan; Latvia; Liechtenstein; Lithuania; Luxembourg; Macedonia, the former Yugoslav Republic of; Moldova; Montenegro; Netherlands; Pakistan; Poland; Romania; Russian Federation; Serbia; Slovakia; Slovenia; Sweden; Switzerland; Tajikistan; Turkey; Turkmenistan; Ukraine; Uzbekistan."

Status in the United States
Not native to, or known to be established in, the United States.

Means of Introductions in the United States
This species has not been introduced to the United States.

2 Biology and Ecology

Taxonomic Hierarchy
From ITIS (2011):

"Kingdom Animalia
  Phylum Chordata
    Subphylum Vertebrata
      Superclass Osteichthyes
        Class Actinopterygii
          Subclass Neopterygii
            Infraclass Teleostei
              Superorder Ostariophysi
                Order Siluriformes
                  Family Siluridae Cuvier, 1816
                    Genus Silurus Linnaeus, 1758
                      Species Silurus glanis Linnaeus, 1758 – sheatfish

Taxonomic status: valid"

Size, Weight, Age Range
From Froese and Pauly (2011):

"Max length: 500 cm SL male/unsexed; (Kottelat et al. 2007 [cited by Froese and Pauly (2011) but not accessed for this report]); common length : 300 cm TL male/unsexed; (Frimodt 1995 [cited by Froese and Pauly (2011) but not accessed for this report]); max. published weight: 306.0 kg (Frimodt 1995); max. reported age: 80 years (Kottelat et al. 2007) Length at first maturity: Lm 87.1, range 86 - ? cm [World's third largest freshwater fish]."

Environment
From Froese and Pauly (2011):

"Benthopelagic; non-migratory; freshwater; brackish; depth range 0 - 30 m (Frimodt 1995)."

Climate/Range
From Froese and Pauly (2011):

"Temperate; 4°C - 20°C (Baensch et al. 1991 [cited by Froese and Pauly (2011) but not accessed for this report]); 62°N - 36°N, 0°E - 80°E."

Distribution Outside of the United States

From Froese and Pauly (2011):

"Europe and Asia. North, Baltic, Black, Caspian and Aral Sea basins, as far north as southern Sweden and Finland; Aegean Sea basin in Maritza and from Struma to Sperchios drainages; Turkey. Absent from the rest of Mediterranean basin. Now widely introduced and translocated throughout Europe and Lake Balkhash basin in Kazakhstan. Several countries report adverse ecological impact after introduction. In Appendix III of the Bern Convention (protected fauna)."

From Freyhof and Kottelat (2008):

"Introduced in Rhône drainage in 1857 and in British Isles during second half of 19th century. Now widely introduced and translocated throughout Europe and Lake Balkhash basin (Kazakhstan)."

Means of Introduction Outside of the United States

From Froese and Pauly (2011):

Intentional introductions for aquaculture and sport fishing in Syria, the Netherlands, Italy, France, China, and Portugal (Bartley 2006; Copp et al. 2009; Gandolfi et al. 1991; Keith et al. 2001; Ma et al. 2003; Pérez-Bote et al. 2005).

High potential for introduction from the pet trade as shown here: http://www.monsterfishkeepers.com/forums/archive/index.php/t-1371.html.

From Lloyd (2012):

"In 1974, a German biologist and fishing aficionado, one Roland Lorkowsky, released a few thousand fry of Wels catfish (Siluro - *Silurus glanis*) into the River Ebro at Flix. The fish adapted frighteningly well to the warm murky waters and has now extended its range right up the Ebro basin, and into the River Segre (Lleida) and the River Cinca (Huesca). It has also colonized Lago Banyoles and Lago de Sau (Girona)."

From Couchman (2012):

"The catfish is widely distributed, but has a greater concentration in the counties of Bedfordshire, Buckinghamshire, and Cambridgeshire. The Wels is not indigenous to this country and they were first introduced into the "Shoulder of Mutton Lake" at Woburn Abbey in Bedfordshire in 1880. Since then they have been stocked both legally and illegally into many lakes throughout the UK."

Remarks

From Slone (2006):

"*Silurus glanis* is a commercial fish consumed by humans. This fish has boneless white flesh that is low in fat and highly palatable. Technological research for artificial reproduction, population genetics and conservation problems have been developed over the past 10 years in the Czech Republic, France and other European countries. It is also a valued game fish in European countries (Froese and Pauly 2011; Linhart et al. 2002 [cited by Slone (2006) but not accessed for this report])."

Short description

From Froese and Pauly (2011):

"Dorsal spines (total): 1; Dorsal soft rays (total): 4 - 5; Anal spines: 1; Anal soft rays: 83 - 95. Distinguished from all other freshwater fishes in Europe by the following unique characters: two pairs of mental barbels; and anal fin with 83-91½ rays. Differs further from the following combination of features: body naked; large, depressed head; dorsal fin with 2-4½ rays; caudal fin rounded or truncate; no adipose fin; and anal rays almost touching tail (Kottelat et al. 2007). Caudal fin with 17 rays (Spillman 1961 [cited by Froese and Pauly (2011) but not accessed for this report])."

Biology

From Froese and Pauly (2011):

"Inhabits large and medium size lowland rivers, backwaters and well-vegetated lakes (Kottelat et al. 2007). Occurs mainly in large lakes and rivers, although occasionally enters brackish water in the Baltic and Black Seas (Frimodt 1995). Found in deep waters of dams constructed on the lower reaches of rivers (Vostradovsky 1973 [cited by Froese and Pauly (2011) but not accessed for this report]). A nocturnal predator, foraging near bottom and in water column. Larvae and juveniles are benthic, feeding on a wide variety of invertebrates and fish. Adults prey on fish and other aquatic vertebrates. Attains first sexual maturity at 2-3 years of age (Kottelat et al. 2007). Spawns in the salt water of the Aral Sea (at Kulandy) (Berg 1964 [cited by Froese and Pauly (2011) but not accessed for this report])."

"Locally threatened due to river regulation destroying shallow spawning sites (Kottelat et al. 2007)."

Human uses

From Froese and Pauly (2011):

"Fisheries: commercial; aquaculture: commercial; gamefish: commercial; food fish yes. Marketed fresh, canned and frozen; can be pan-fried and baked (Frimodt 1995)."

Diseases

From Froese and Pauly (2011):

"Spring Viraemia of Carp, Viral diseases."

From USGS (2012):

"Common carp belonging to the Cyprinidae family are the principal host species of SVCV. Natural infections of SVCV have also occurred in other cyprinid fish. Fish species from other families of Poeciliidae, Esocidae, Centrarchidae, Siluridae, and Salmonidae have also been infected by SVCV. Due to the highly infectious nature of SVCV and potential impact this virus could have on susceptible fish populations globally, any detection of SVCV requires notification within 48 hours to the Office of Internationale Epizootic (OIE), the organization charged with regulating world animal health. SVCV is one of only nine piscine viruses recognized worldwide by the OIE as a notifiable animal disease."

Threat to humans

From Froese and Pauly (2011):

"Potential pest."

3 Impacts of Introductions

From Lloyd (2012):

"The results have been catastrophic. In many stretches, the fish has almost completely wiped out several autochthonous species with its voracious appetite, hence its local nickname, 'The Ebro Monster'."

From Bruguera (2007):

"Due to its morphologic characteristics including its large size, enormous mouth, great length, and its habits as a voracious predator it is a serious danger to the populations of native fish and other vertebrates (amphibians, mammals, birds, etc.) that can see effects to their abundance and survival. Due to the significant alteration of the trophic structure of the affected ecological communities, the Wels catfish may also reduce the quality of the water of our impounded waters, which supply a large part of the population. [Translated from Spanish]"

From Copp et al. (2009):

"Potential impacts in its introduced European range include disease transmission, hybridization (in Greece with native endemic Aristotle's catfish [*Silurus aristotelis*]), predation on native species, and possibly the modification of food web structure in some regions."

From Kottelatand and Freyhof (2007):

"Threatens the largest population of *Chondrostoma phoxinus* in Lake Busko**.**"

From Boulêtreau et al. (2011):

"Here, the observed aggregations of alien fish (*S. glanis*) potentially represent the highest biogeochemical hotspots ever reported for freshwater ecosystems, as our estimates correspond to 83–286 fold and 17–56 fold the maximal fish excretion values for phosphorus and nitrogen, respectively, reported in the literature (McIntyre et al. 2008; Schaus 1997 [cited by Boulêtreau et al. (2011) but not accessed for this report]). Therefore, these aggregations can potentially have strong implications on ecosystem functioning since these fish may translocate nutrients from their feeding areas, concentrate locally these nutrients in the aggregation area and subsequently affect primary production and nutrient cycling. Therefore, this phenomenon represents another example of unexpected potential ecological impacts of alien species (Cucherousset 2011 [cited by Boulêtreau et al. (2011) but not accessed for this report])."

4 Global Distribution

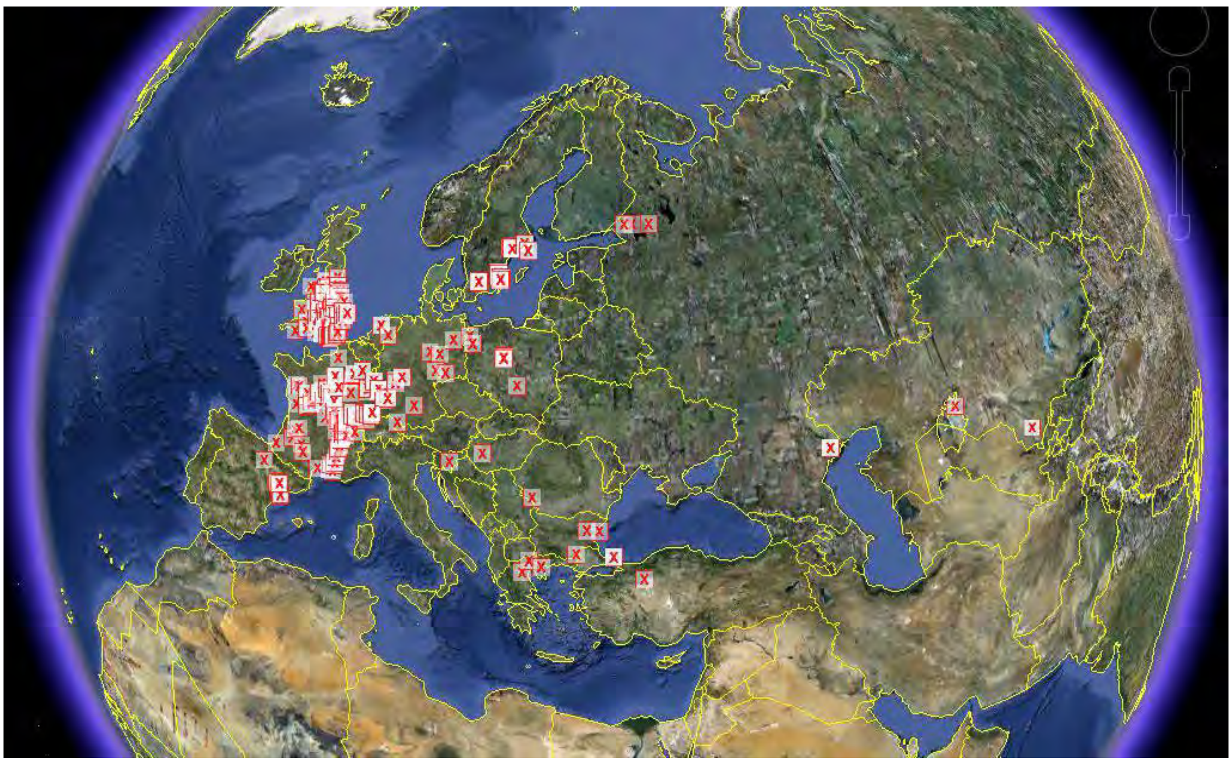

Figure 1. Global distribution of *S. glanis*. Map from Google Earth.

5 Distribution in the United States

No known U.S. locations.

6 CLIMATCH

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010; 16 climate variables; Euclidean Distance) was high for a large portion of the country. Very high matches were found in the Great Lakes states, the western plains, and the interior northwest. Climate 6 match indicated that the continental United States has a very high climate match. The range for very high climate match is 0.103 and greater, climate match of the Wels catfish is 0.632.

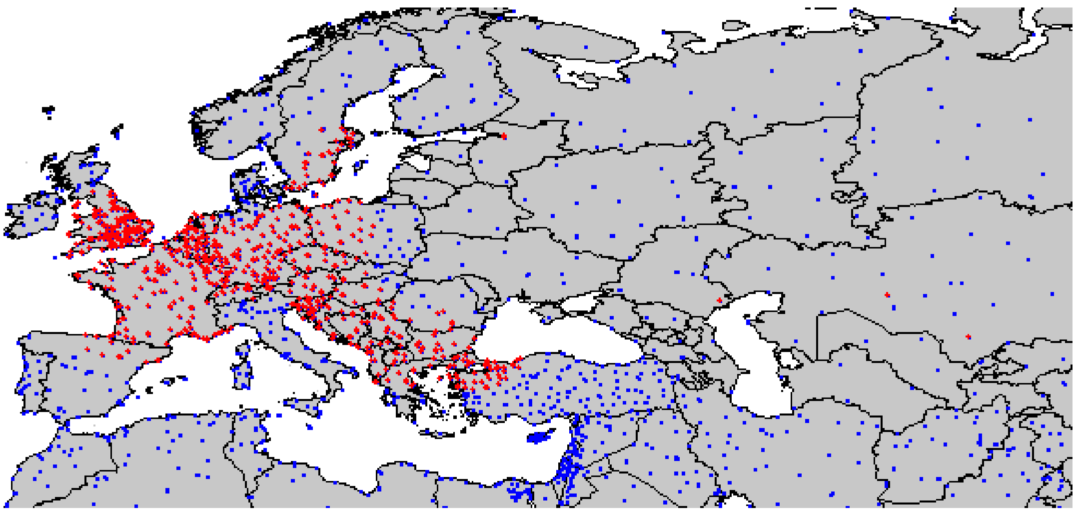

Figure 2. CLIMATCH source map showing weather stations selected as source locations (red) and non-source locations (blue) for *S. glanis* climate matching. Source locations from Froese and Pauly (2011).

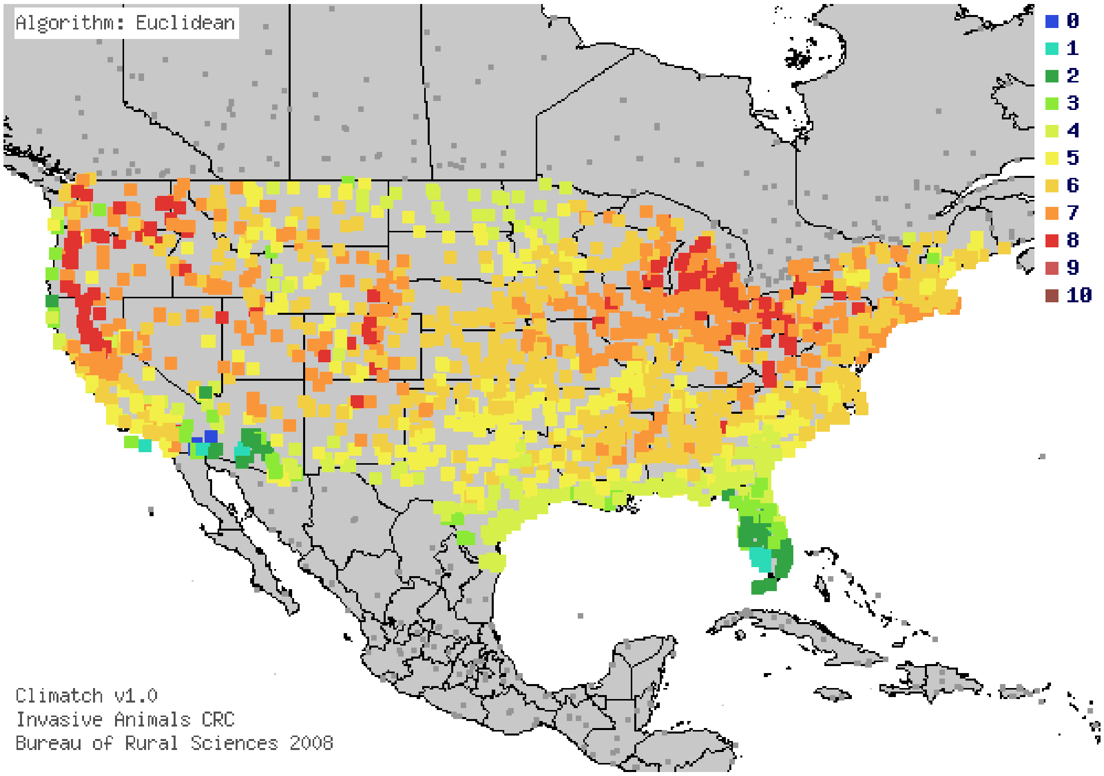

Figure 3. Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for S. glanis in the continental United States based on source locations reported by Froese and Pauly (2011). 0= Lowest match, 10=Highest match.

Table 1. CLIMATCH (Australian Bureau of Rural Sciences 2010) climate match scores.

CLIMATCH Score	0	1	2	3	4	5	6	7	8	9	10
Count	3	15	63	77	223	344	628	470	147	0	0
Climate 6 Proportion =		0.632	(High)								

7 Certainty of Assessment

Information on the biology, invasion history, and impacts of this species is sufficient to give an accurate description of the risk posed by this species. Certainty of this assessment is high.

8 Risk Assessment

Summary of Current U.S. Status

Establishment and impacts in Europe documented. The main impacts of concern are effects predation on prey fish, competition with predators, disease transmission, and habitat alteration. *S. glanis* has been purposefully stocked, and inadvertently stocked in the wild along with other species. *S. glanis* is a species that could potentially be imported for sport fishing, aquaculture, live food trade, or use in the pet trade.

Assessment Elements

- **History of Invasiveness (See Section 3):** High
- **Climate Match (See Section 6):** High
- **Certainty of Assessment (See Section 7):** High
- **Overall Risk Assessment: High**

Table 1. Generalized, projected impacts of *S. glanis* on natural resources of the continental United States. The climate match is high between the native/established ranges of *S. glanis* and that of the continental United States. Therefore, details of impacts are too numerous to list in this screening report. Specific details of impacts will depend on local ecological structure (i.e., fish species composition, population abundance, and community structure; food resource biomass and community structure; and habitat variables).

Threat	Projected Level of Impact to Wildlife Resources of the U.S.	Description of Impact	Projections of Impacts to Wildlife Resources of the U.S.
Habitat Degradation	High	High population densities of *S. glanis* could lead to extremely high nutrient loads. Indirect effect of food web alteration could be water quality degradation (Boulêtreau et al. 2011).	Water quality degradation impacts are projected to be greatest wherever established populations result high abundance of *S. glanis*, and in lentic systems or slow-moving lotic systems where fast flow and discharge are not present to efficiently transport high nutrient loads downstream.
Species Extirpation/Extinction	High	*S. glanis* has been responsible for numerous native species population reductions in Europe through predation (Copp et al. 2009). Stomach contents of *S. glanis* from the Tarn River (France) indicated a dominance of	Species most likely to be impacted are benthic native fish species (particularly cyprinids) that would be seen as prey for *S. glanis*, as this species more commonly feeds near the bottom of the water column. Non-fish species such as mollusks could also be significantly impacted. This is particularly a concern if *S. glanis* becomes established in waters where either native cyprinds or mollusks are

		cyprinid fishes, and benthic prey (mollusks and crayfish) in their diet (Syväranta et al. 2010). Birds, amphibian, and mammals were also documented in the diet of Tarn River *S. glanis*.	imperiled.
Food Web Disruption	High	Drastic food web disruptions caused by *S. glanis* due to its level of predation on native species as seen in Spain (Iberianature 2011; Inavsiber 2011).	In any habitat *S. glanis* invades, native prey fishes (particularly cyprinids and mollusks) are at risk to be depleted. Trophic levels occupied by these species are at risk of being either being disrupted or eliminated from the food web.
Degradation of Fish Stocks	High	See description of impact for Food Web Disruption, and Predation.	See projected impacts to U.S. wildlife resources listed in Species Extirpation/Extinction above. Also, Spring Viraemia of Carp (SVCV) virus has also been isolated from *S. glanis*. Due to the highly infectious nature of SVCV and potential impact this virus could have on susceptible fish populations, it is prudent to either not import *S. glanis*, or to test each lot of fish being imported for the disease.
Competition	High	*S. glanis* will most likely become top predator and dominant fish species in the invaded habitat. Stable isotope analysis indicated *S. glanis* shares trophic position with pike (*Esox lucius*) and	Competition with native predators is probable, when and where food resources (e.g., cyprinds, mollusks) are limiting. Species at risk of competition with *S. glanis* include northern pike (*Esox lucius*), walleye (*Sander vitreus*), and sauger (*Sander canadensis*).

		pikeperch (*Sander lucioperca*) (Syväranta et al. 2010).	
Predation	High	Stomach contents of *S. glanis* from the Tarn River (France) indicated a dominance of cyprinid fishes, and benthic prey (mollusks and crayfish) in their diet (Syväranta et al. 2010). In one Spanish river, *S. glanis* has reduced abundance of most prey species in some areas. In Lake Busco, may have caused the extinction of *Chondrostoma phoxinus* (Kottelat et al. 2007).	*S. glanis* is capable of establishing populations in lakes, rivers, and streams. *S. glanis*, where established, will increase predation pressure on almost all prey species. Species inhabiting waters deeper than 30 m may not be affected, because *S. glanis* mainly feeds in waters no deeper than 30 m.
Reproductive Interference	Medium	Reductions in abundance of fish and mollusk species may result from water quality degradation, predation, SVCV disease, and food web disruption.	Reductions in abundance of native fishes from impacts of water quality degradation, predation, SVCV disease, and food web disruption could lead to adult stock sizes that are too low to maintain recruitment necessary to sustain populations. Mollusk reproductive interference could result from impacts of water quality degradation, predation, food web disruption, and reduced abundance of fish hosts for mollusk larvae.

Table 2. Generalized, projected impacts of *S. glanis* on natural resources of the connected Great Lakes Basin (i.e., Great Lakes, connecting channels, and tributaries). The climate match is high between the native/established ranges of *S. glanis* and that of the connected Great Lakes Basin. Therefore, details of impacts are too numerous to list in this screening report. Specific details of impacts will depend on local ecological structure (i.e., fish species composition, population abundance, and community structure; food resource biomass and community structure; and habitat variables).

Threat	Projected Level of Impact to Wildlife Resources of the Great Lakes Basin	Description of Impact	Projections of impacts to Wildlife Resources of the Connected Great Lakes Basin
Habitat Degradation	Medium	High population densities of *S. glanis* could lead to extremely high nutrient loads. Indirect effect of food web alteration could likely be water quality degradation (Boulêtreau et al. 2011).	Decreased water quality is projected to most affect coastal Great Lakes habitat, and wide-channel, slow-moving tributary and connecting channel habitats.
Species Extirpation/Extinction	High	*S. glanis* has been responsible for numerous native species population reductions in Europe through predation (Copp et al. 2009). Stomach contents of *S. glanis* from the Tarn River (France) indicated a dominance of cyprinid fishes, and benthic prey (mollusks and crayfish) in their diet (Syväranta et	Species most likely to be impacted are benthic native fish species (particularly cyprinids) that would be seen as prey for *S. glanis*, as this species more commonly feeds near the bottom of the water column. Non-fish species such as mollusks could also be significantly impacted. This is particularly a concern if *S. glanis* becomes established in waters where native mollusks are imperiled.

		al. 2010). Birds, amphibian, and mammals were also documented in the diet of Tarn River *S. glanis*.	
Food Web Disruption	High	Drastic food web disruptions caused by *S. glanis* due to its level of predation on native species as seen in Spain (Iberianature 2011; Inavsiber 2011).	In any habitat *S. glanis* invades, native prey fishes (particularly cyprinids and mollusks) are at risk to be depleted. Trophic levels occupied by these species are at risk of being either disrupted or eliminated from the food web. Nearshore food webs are at greatest risk of disruption.
Degradation of Fish Stocks	High	See description of impact for Food Web Disruption.	See projected impacts to U.S. wildlife resources listed in Species Extirpation/Extinction above.
Competition	High	Competes heavily with any other top-level predator species native to the invaded habitat. Stable isotope analysis indicated *S. glanis* shares trophic position with pike (*Esox lucius*) and pikeperch (*Sander lucioperca*) (Syväranta et al. 2010).	Competition with native predators is probable, when and where food resources (e.g., cyprinds, mollusks) are limiting. Species at risk of competition with *S. glanis* include northern pike (*Esox lucius*), walleye (*Sander vitreus*), and sauger (*Sander canadensis*). Populations of walleye in various parts of the Great Lakes, connecting channels, and tributaries are at risk of competition with established populations of *S. glanis*.
Predation	High	Stomach contents of *S. glanis* from the Tarn River (France) indicated a dominance of cyprinid fishes, and benthic prey (mollusks and crayfish) in their diet (Syväranta et al. 2010). In one	Cyprinid and mollusk populations in nearshore, bay, tributary, and connecting channel habitats are at risk of suppression. In the Great Lakes, species that survive in depths greater than 30 m may escape any or all predatory affects.

		Spanish river, *S. glanis* has removed most prey species in some areas. (Iberianature 2011). In Lake Busco, may have caused the extinction of *Chondrostoma phoxinus* (Kottelat et al. 2007).	
Reproductive Interference	Medium	Reductions in abundance of fish and mollusk species may result from water quality degradation, predation, SVCV disease, and food web disruption.	Reductions in abundance of native fishes from impacts of water quality degradation, predation, SVCV disease, and food web disruption could lead to adult stock sizes that are too low to maintain recruitment necessary to sustain populations. Mollusk reproductive interference could result from impacts of water quality degradation, predation, food web disruption, and reduced abundance of fish hosts for mollusk larvae.

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